ABSTRACT OF THE DISCLOSURE

A timing recovery system includes a phase locked loop with a variable bandwidth loop filter, several data dependent gain units, and three proportional paths with non-linear control. The system provides excellent jitter tolerance with a wide variation in data density and large amplitude jitter with a wide frequency range. The gain of both an included loop filter and a phase detector may be varied with both frequency and data density. Direct, unfiltered adjustments may be made to phase based on a received data pattern and phase error magnitude to reduce loop latency and provide temporary and immediate boost in the loop gain of the phase locked loop. Direct, unfiltered adjustments may also be made to phase based on the sign of the first differential of an accumulator output during long strings of zeros to help maintain tracking even with a very low data density.

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